

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

IN RE APPLICATION OF TAKASHI HAGINO ET AL.

FOR: METHOD FOR MANUFACTURING POLYCRYSTALLINE SEMICONDUCTOR
LAYERS AND THIN-FILM TRANSISTORS, AND LASER ANNEALING
APPARATUS

AMENDMENT

Commissioner of Patents and Trademarks
Washington, DC 20231

Dear Sir:

Before examining the present application, please amend as follows:

IN THE TITLE:

Please amend the title in "clean" format, as follows:

METHOD FOR MANUFACTURING POLYCRYSTALLINE
SEMICONDUCTOR LAYERS AND THIN-FILM TRANSISTORS,
AND LASER ANNEALING APPARATUS

IN THE SPECIFICATION:

Please amend the paragraph beginning on page 2, line 21 and continuing to page 3, line 8 in
"clean" format, as follows:

The process atmosphere in the chamber during annealing is one important factor
influencing the surface roughness and crystallizability of a p-Si. Excimer laser annealing in a
nitrogen atmosphere under normal pressure can realize a high productivity of a polycrystalline
silicon film. However, research of the present applicant demonstrated that it is difficult to
control the surface roughness of a p-Si manufactured in the nitrogen atmosphere under the

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normal pressure, and that under such conditions the Si surface tends to be rough. In order to prevent formation of rough surfaces, annealing is continued while the chamber 100 is evacuated using the extraction pump 300 as shown in Fig. 1.

IN THE ABSTRACT:

Please amend the Abstract in “clean” format, as follows:

A laser annealing apparatus is provided in which laser light is irradiated onto an amorphous semiconductor layer placed inside an annealing chamber through a chamber window, thereby poly-crystallizing the amorphous semiconductor film. Inside the annealing chamber a low degree vacuum (about 1.3×10^3 Pa to about 1.3 Pa) is maintained at a room temperature. An inert gas such as nitrogen, hydrogen, or argon is introduced into the atmosphere while maintaining the low degree vacuum. As a result, the surface smoothness of the polycrystalline semiconductor layer is comparable to that resulting from high degree vacuum annealing, while, unlike high degree vacuum annealing, there is less contamination of the chamber window and productivity is improved.

REMARKS

Applicants request entry of the present amendments to fix typographical errors and to conform the abstract to U.S. practice. No new matter is being introduced by this Amendment as antecedent support is set forth in the original specification and in the original claims. Attached hereto is a marked-up version of the changes made. The attached page is captioned **“Version with Markings to Show Changes Made.”**

Prosecution on the merits is respectfully requested.

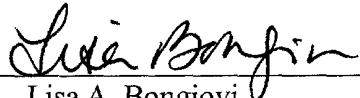
The Examiner is invited to contact Applicant's Attorneys at the below-listed telephone number regarding this Preliminary Amendment or otherwise regarding the present application.

If there are any charges with respect to this Amendment or otherwise, please charge them to Deposit Account No. 06-1130 maintained by Applicants' attorneys.

Respectfully submitted,

TAKASHI HAGINO ET AL.

CANTOR COLBURN LLP
Applicants' Attorneys

By: 
Lisa A. Bongiovi
Registration No. 48,933
Customer No. 23413

Date: February 22, 2002
Address: 55 Griffin Road South, Bloomfield, CT 06002
Telephone: 860-286-2929

MARKED UP VERSION TO SHOW CHANGES MADE

IN THE TITLE:

Please amend the title in “marked up” format, as follows:

METHOD FOR MANUFACTURING POLYCRYSTALLINE
~~SEMICONDUCTOR~~ SEMICONDUCTOR LAYERS AND THIN-FILM TRANSISTORS,
AND LASER ANNEALING APPARATUS

IN THE SPECIFICATION:

Please amend the paragraph beginning on page 2, line 21 and continuing to page 3, line 8 in “marked up” format, as follows:

The process atmosphere in the chamber during annealing is one important factor influencing the surface roughness and crystallizability of a p-Si. Excimer laser annealing in a nitrogen atmosphere under normal pressure can realize a high productivity of a polycrystalline silicon film. However, research of the present applicant demonstrated that it is difficult to control the surface roughness of a p-Si manufactured in the nitrogen atmosphere under the normal pressure, and that under such conditions the Si surface tends to be rough. In order to prevent formation of rough surfaces, annealing is continued while the chamber 100 is evacuated using the extraction pump 300 as shown in Fig. 41.

IN THE ABSTRACT:

Please amend the Abstract in “marked up” format, as follows:

A laser annealing apparatus is provided in which laser light is irradiated onto an amorphous semiconductor layer placed inside an annealing chamber (100) through a chamber window (120), thereby poly-crystallizing the amorphous semiconductor film. Inside the annealing chamber ~~100~~ a low degree vacuum (about 1.3×10^3 Pa to about 1.3 Pa) is maintained at a room temperature. An inert gas such as nitrogen, hydrogen, or argon is introduced into the atmosphere while maintaining the low degree vacuum. As a result, the surface smoothness of the polycrystalline semiconductor layer is comparable to that resulting from high degree vacuum annealing, while, unlike high degree vacuum annealing, there is less contamination of the chamber window (120) and productivity is improved.